

## Luis M. Rocha

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### A. Professional Preparation

Instituto Superior Técnico, Lisbon, Portugal	Mechanical Engineering	B.S.	1988
Instituto Superior Técnico, Lisbon, Portugal	Systems Engineering	M.S.	1990
State University of New York, Binghamton	Systems Science	Ph.D.	1997
Los Alamos National Laboratory, NM, USA	Complex Systems	PostDoc	1998

### B. Appointments

2021--Present	<u>George J. Klir Professor of Systems Science</u> , Binghamton University, SUNY.
2020-2021	<u>Visiting Professor</u> , Binghamton University, SUNY
2019--Present	<u>Director</u> , Consortium for Social & Biomedical Complexity, Binghamton & Indiana University
2019-2021	<u>Visiting Professor</u> , NOVA School of Business and Economics, Portugal
2018-2021	<u>Advisory Council Member</u> Indiana University Network Science Institute
2017-2023	<u>Director</u> NSF-NRT Interdisciplinary Training Program in Complex Networks and Systems
2017-2019	<u>Visiting Professor</u> , Center for Theoretical Physics, Aix-Marseille University, France
2016-2018	<u>Visiting Professor</u> , Neuroscience & Clinical Sciences, Fundação Champalimaud, Portugal
2013-2021	<u>Professor</u> , Luddy School of Informatics, Computing, and Engineering, Indiana University
2008-2020	<u>Director</u> , Complex Networks & Systems track, Informatics PhD Program, Indiana University
2002-Present	<u>Principal Investigator</u> , Instituto Gulbenkian de Ciencia, Portugal
2005-2015	<u>Director</u> , Computational Biology Collaboratorium, and co-director of Ph.D Program in Computational Biology, Instituto Gulbenkian de Ciencia, Portugal
2004-2013	<u>Associate Professor</u> , School of Informatics & Computing, Indiana University
1998-2002	<u>Team Leader</u> of the Complex Systems Modeling Team, Los Alamos National Laboratory
1999-2004	<u>Technical Staff Member</u> , Los Alamos National Laboratory
1995-1997	<u>Adjunct Professor</u> , State University of New York, Binghamton, Dep. of Systems Science
1990-1991	<u>Graduate Research Assistant</u> , Laboratorio Nacional de Engenharia Civil, Portugal

### C. Publications

#### Most related to proposed project

1. R.B. Correia, A. Barrat, L. M. Rocha [2023]. "Contact networks have small metric backbones that maintain community structure and are primary transmission subgraphs". *PLoS Computational Biology*. **19**(2): e1010854. doi: 10.1371/journal.pcbi.1010854.
2. R.B. Correia, J.M. Almeida, Ma.J. Wyrwoll, I.Julca, D. Sobral, C.S. Misra, L.G. Guilgur, H.-C. Schuppe, N. Silva, P. Prudêncio, A. Nóvoa, A. S. Leocádio, J. Bom, M. Mallo, S. Kliesch, M. Mutwil, L.M. Rocha, F.Tüttelmann, J. D. Becker, P. Navarro-Costa [2023]. "Prevalence and differences in the co-administration of drugs known to interact: an analysis of three distinct and large populations". *eLife*. In Press. Reviewed reprint: eLife-RP-TR-2024-95774. Also available at: bioRxiv 2022.03.02.482557, doi: 10.1101/2022.03.02.482557.
3. K.H. Park, F.X. Costa, L.M. Rocha, R. Albert, J.C. Rozum [2023]. "Robustness of biomolecular networks suggests functional modules far from the edge of chaos". *PRX Life*. **1**, 023009. DOI: 10.1103/PRXLife.1.023009.
4. A. Gates, Correia, R.B., X. Wang, L.M. Rocha [2021]. "The effective graph reveals redundancy, canalization, and control pathways in biochemical regulation and signaling." *Proceedings of the National Academy of Sciences*. **118** (12) e2022598118. PMC8000424.
5. Simas, T., R.B Correia and L.M. Rocha [2021]. "The distance backbone of complex networks". *Journal of Complex Networks*. **9** (6), cnab021. DOI: 10.1093/comnet/cnab021.

### Other relevant and significant publications

1. T. Parmer, L.M. Rocha, F. Radicchi [2022]. "Influence maximization in Boolean Networks." *Nature Communications*. **13**, 3457, DOI: 10.1038/s41467-022-31066-0.
2. Rocha, L.M [2022]. "On the feasibility of dynamical analysis of network models of biochemical regulation." *Bioinformatics*. **btac360**, DOI: 10.1093/bioinformatics/btac360.
3. R.B. Correia, I.B Wood, J. Bollen, L.M. Rocha [2020]. "Mining social media data for biomedical signals and health-related behavior". *Annual Review of Biomedical Data Science*, 3:1. DOI: 10.1146/annurev-biodatasci-030320-040844. NIHMSID:1596369.
4. A. Gates, A. and L.M. Rocha [2016]. "Control of complex networks requires both structure and dynamics". *Scientific Reports*. **6**, 24456. PMC4834509.
5. G.L.Ciampaglia, P.Shiralkar, L.M.Rocha, J. Bollen, F. Menczer, A. Flammini [2015]. "Computational fact checking from knowledge networks." *PLoS ONE*. 10(6):e0128193.

### D. Synergistic activities

1. Translational research: For decades, I have developed complex networks & systems methods and partnered with subject area experts to apply them to modeling biomedical problems. I formed the *Complex Systems Modeling Team* at the Los Alamos National Laboratory in 1999 and currently direct the new *Consortium for Biomedical and Social Complexity* between Binghamton University and Indiana University. I have worked with life scientists in institutions such as the Santa Fe Institute and the Instituto Gulbenkian de Ciencia to solve problems of biomedical importance using AI, data science, and complexity science.
2. Innovations in training: As Director and PI of the *NSF-NRT: Interdisciplinary Training in Complex Networks and Systems* at Indiana University, I have led the unique design and implementation of a large student program wherein trainees enroll in a dual-major PhD program in Complex Networks and Systems and an empirical domain (e.g. biology, ecology, neuroscience, economics, cognitive science, sociology).
3. Innovations in teaching: I have developed and presented multiple classes and short courses in novel areas of study and been the recipient of the IU Trustees' Award for Teaching Excellence in 2006 and 2015. Examples relevant to the proposal include: "Intro to Systems Science" (2021-23), "Evolutionary Systems & Bioinspired computing" (2005-15, IU; 2022-24, BU), "Advanced Complex Systems" (Graduate, 2012-21), "Introduction to Informatics" (Graduate, 2008-15).
4. Service to the scientific community - knowledge transfer: I have delivered more than 130 invited and keynote presentations including the following selected examples from the past three years: keynote at the Social Media Mining for Health workshop, at the American Medical Informatics Association 2023 Annual Symposium, New Orleans, USA; keynote at the Multiscale & Integrative Complex Networks: Experiments & Theories Symposium at the International School and Conference on Network Science, Vienna, Austria; Keynote at the Network Science for The Sustainable Development Goals, Symposium at the International School and Conference on Network Science, Vienna, Austria; invited speaker at the Centre for Urban Mental Health, University of Amsterdam, Netherlands, April 12, 2023; invited speaker at the Northwestern Institute on Complex Systems Seminar Series, 2022; keynote speaker at the Artificial Intelligence, HPC and Biomedicine: implicit biases, scientific, technical and ethical challenges, Barcelona Supercomputing Center, 2021.
5. Service to the scientific community - advisory roles: External advisory board member of the Environmental Health Institute (Instituto de Saúde Ambiental), University of Lisbon Medical School (ISAMB-FMUL); Member of the advisory council of the *Complex Systems Society* (elected member 2021-2023); member of the advisory council of the *Indiana University Network Science Institute* (2018-2021); external review committee member of the *Center for the Study of Complex Systems* (CSCS) at the University of Michigan and the *Biocomputational Evolution in Action Consortium* (BEACON) NSF Science & Technology Center at Michigan State University; Editorial Board member of various journals such as *PLOS Complex Systems* (Section Leader: Complex Systems in Nature), *BMC Bioinformatics*, *Complexity*, *Journal of Computational Science*, *Frontiers in Physics - Complex Systems*, *Frontiers in Computational Intelligence*, *PLoS ONE*, etc; organizing committee member of key conferences in field such *Complex Networks Conference* (since 2018), RECOMB 2010, ECAL (2007), ALIFE (2006), etc; program committee member of *Conference on Complex Systems*, *NetSci*, *CompleNet*, etc.